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3 NEW HAMPSHIRE 4 MERRIMACK AND
NEW HAMPSHIRE 5 WHITE MOUNTAIN POWER

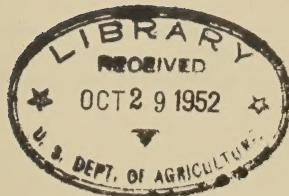
FIELD APPRAISAL ANALYSIS //

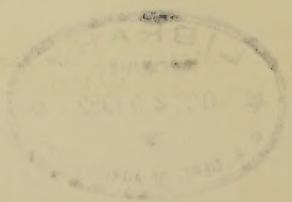
Prepared by
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✓ RURAL ELECTRIFICATION ADMINISTRATION

Field Appraisal
Completed in
July 1952

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September 22, 1952

Program Analyst
Office of the AdministratorSUMMARY AND CONCLUSIONAREA CHARACTERISTICS

The system area covers most of the State of New Hampshire. The State income is derived principally from industry and recreation. Agricultural income ranks third. The average gross income per farm in 1949 was \$3,500 as compared to the United States average of \$4,026. The State lends itself to recreation with its wooded area spotted with lakes and mountains. Pleasure seekers from New England use the State for hunting, fishing, summer vacations and winter sports. Most of the manufacturing is located outside the system's area. Mining of mica, and other minerals, important to the defense effort, has increased. Population has increased 8 percent in the past decade. Urban population has been decreasing while the rural population has increased. The number of farms decreased 29 percent between 1945 and 1950. The average size farm increased from 107 to 128 acres during the same period. Forty-four percent of those residing on farms received more income from off-farm sources than from the sale of agricultural products.

ULTIMATE NUMBER OF CONSUMERS

On May 31, 1952, New Hampshire 4 was serving 5,801 consumers, and New Hampshire 5 was serving an estimated 9,100 consumers. The manager estimates 800 potential consumers for New Hampshire 4 and 600 for New Hampshire 5 within the next 3 years, or an increase of 9 percent. The increase will be from presently existing potential consumers and those resulting from the construction of new homes. The field survey disclosed approximately 500 existing, potential consumers located within the system's area. Construction of new homes was evidenced during the survey. Thirty-five to 40 percent of the present consumers, excluding commercials, are seasonal. The appraisers are of the opinion that the manager's estimates of future numbers of consumers are reasonable.

ESTIMATED FUTURE CONSUMPTION OF ELECTRICITY

Since energization of New Hampshire 4 in 1940, farm consumers have had an average monthly increase of 11 kwh, and the nonfarm residential consumers approximately 6 kwh. Those interviewed in the field survey for New Hampshire 5 showed an increase since 1941 through 1951 of approximately 5 kwh monthly for residential consumers and 3 kwh for seasonal consumers. The respondents interviewed in both New Hampshire 4 and 5 indicated increases during the next 3 years about equal to the annual increase for the past 10 years.

LPG gas is being used within the service area, varying from 10 percent to 62 percent within the different divisions of New Hampshire 4 and 5. Gas is being used primarily for cooking, water heating and refrigeration.

2-Summary -- New Hampshire 4 and 5 -- September 22, 1952

Major uses of electricity will be for water heating, cooking, refrigeration and house lighting among the residential and seasonal consumers. Farm consumers used about 40 percent of the total kwh consumption in New Hampshire 4 and practically none in New Hampshire 5.

Based on all factors believed to be significant, this analysis leads to the following average monthly estimates, which are certified as being reasonable and may be expected to be attained by the years specified.

<u>Class of Consumer</u>	<u>Calendar Year 1951</u>	<u>1954</u>	<u>1957</u>	<u>1962</u>
New Hampshire 4				
Farm	1721/	205	235	290
Nonfarm residential	951/	110	135	175
Seasonal	311/	45	50	60
New Hampshire 5				
Residential	1472/	170	200	255
Seasonal	992/	105	120	140

1/ Source: Monthly Operating Reports.

2/ Source: Billing records of the respondents interviewed.

September 22, 1952

Program Analyst
Office of the Administrator

ANALYSIS OF BASIC FACTORS RELATING TO THE
RURAL ELECTRIFICATION LOAN FOR
NEW HAMPSHIRE 4 MERRIMACK AND
NEW HAMPSHIRE 5 WHITE MOUNTAIN POWER

This analysis of the probable future consumption of electricity for the New Hampshire Electric Cooperative, Inc., with headquarters in Plymouth, New Hampshire, (Figure 1) is based on a field study conducted by Reuben Glazier and Earl A. Gardner, Agricultural Economists, and was completed during July 1952. The field work consisted primarily of visits to 79 served farm, 78 served nonfarm, 74 served seasonal and 49 unserved consumers in New Hampshire 4 area; also, 231 served residential, 73 served seasonal and 17 unserved consumers in New Hampshire 5 White Mountain Power territory.^{1/} In addition, local business-men and agricultural leaders, both local and state-wide, were consulted as to economic trends and their estimates of the future for the area with respect to the use of electric power in New Hampshire.

ULTIMATE NUMBER OF CONSUMERS

As of May 31, 1952, the New Hampshire Electric Cooperative, Inc., was serving 5,801 consumers, and New Hampshire 5 White Mountain Power had an estimated 9,100 consumers. The manager has estimated 800 potential consumers for New Hampshire 4 and 600 potential consumers for New Hampshire 5 within the next 3 years, or an increase of 9 percent over those receiving service at present (see Figure 2). The ultimate number, according to the manager, will consist of those now served, the presently existing potentials, as well as those resulting from new construction. This development has been supported by trends since 1946 and was seen to be continuing in 1952 primarily among the seasonal consumers. Maps of the cooperative's system area were furnished the field appraisers to locate consumers drawn in the sample. These maps were prepared by L. E. Wooten and Company and were stamped "preliminary." Approximately 2,100 potential users were indicated on the maps for New Hampshire 4 and 5. It was apparent the definition of a potential consumer, by the above engineering company, differed considerably from that of R.E.A. The maps showed potential where no buildings actually existed, and upon checking, owners of

^{1/} Respondents selected were from a random sample taken from tabular lists and comprised approximately 5 percent of the consumer units in the system area. In the larger substation areas, only those found at home on the first visit were used as they formed an adequate number of respondents for the survey. The over-all average of the respondents for both New Hampshire 4 and New Hampshire 5 is approximately 4 percent of the total number of consumer units in the system's area. Potential consumer units were selected by random sample from those indicated on maps furnished by the cooperative of unelectrified potential consumers.

the property had no intention of building for 5 or 10 years, if at all; some were old farm houses not occupied due to consolidation of farms. One potential listed on the map proved to be a church that had been unoccupied for years and there was no known date for ever reopening; others were ice houses built on skids which were hauled out on the lakes for winter fishing. Of those buildings actually existing, it was estimated a total of about 500 could be considered as potentials which would probably be occupied within the next 5 years. On the other hand, many new camps or homes are built each year around the lakes and in the mountains where hunting and fishing prevail. Should this building tempo continue, it is likely that the ultimate number of consumers for New Hampshire 4 and 5 will meet the manager's estimates. At the time the field work was completed, New Hampshire 4 had 160 new applicants for service to whom the cooperative had not been able to extend service. Most of these were seasonal consumers who are building new homes. A number of farms are being sold in lots for summer homes near lake shores. Also a number of old homes were being remodeled for seasonal use only.

During the period 1946-1950 there was an average of 420 new consumers connected annually on the New Hampshire 4 lines. As of May 1952, this cooperative had 568 places where lines had been built but which were not then receiving service.

The random sample of consumer units developed for the survey indicated the nature of consumer units in the area with respect to electric service as follows:

TABLE I
DISTRIBUTION OF CONSUMER UNITS
WITH RESPECT TO ELECTRIC SERVICE

Nature of Consumer Unit	Units In Sample	Estimate of Total Number of Units In Service Area ^{1/}
<u>New Hampshire 4^{2/}</u>		
Farms, served	81	2,025
Nonfarm residential, served	79	1,975
Seasonal, served	73	1,825
Farm, potential	3	60
Nonfarm residential, potential	8	160
Seasonal, potential	10	200
Abandoned	8	160
Not interested in service	17	340
Disconnected	3	60
Total	282	6,805
<u>New Hampshire 5^{3/}</u>		
Residential, served	231	5,775
Seasonal, served	73	1,825
Total	304	7,600 ^{4/}

New Hampshire 4 and 5 - September 22, 1952

- 1/ Derived by expanding sample data.
- 2/ For New Hampshire 4, the number of served consumers actually interviewed was approximately 4 percent; for the unserved respondents, approximately 5 percent.
- 3/ For New Hampshire 5, the number of served consumers actually interviewed was approximately 4 percent. Observations in the New Hampshire 5 area as to existing, non-existing and abandoned buildings for potentials are comparable with the findings for New Hampshire 4. The estimates do not include small or large commercial consumers.
- 4/ In addition, there are approximately 1,400 commercial consumers in New Hampshire 5.

HISTORY OF AVERAGE MONTHLY KWH CONSUMPTION
AS SHOWN BY THE BILLING RECORDS

New Hampshire 4

Historical consumption records for the farm consumers interviewed during the survey indicated a generally rising average consumption. The consumers connected in recent years appear to have higher initial averages than consumers receiving service over the longer period of time. This is shown in the following table.

TABLE II

FARM CONSUMPTION OF ELECTRICITY AS RELATED
TO LENGTH OF TIME WITH ELECTRIC SERVICE
NEW HAMPSHIRE 4

Electricity	Total Number of Yrs. With Number of Schedules	Average Monthly Kwh Consumption by 12 Month Period 1/											
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
12	7	81	91	99	114	149	175	194	195	223	218	227	230
11	11	--	43	47	50	53	64	71	81	101	127	129	133
10	12	--	--	36	39	40	50	60	60	78	109	126	135
9	3	--	--	--	75	101	166	209	172	243	241	228	270
8	2	--	--	--	--	40	45	45	66	73	75	94	120
7	9	--	--	--	--	--	74	85	106	132	165	133	137
6	10	--	--	--	--	--	--	120	136	184	180	156	161
5	6	--	--	--	--	--	--	--	43	69	87	102	126
4	4	--	--	--	--	--	--	--	--	96	103	160	175
3	2	--	--	--	--	--	--	--	--	--	89	258	145
2	4	--	--	--	--	--	--	--	--	--	--	202	214
1	4	--	--	--	--	--	--	--	--	--	--	--	113

1/ The first year's usage was determined from the average monthly kwh consumption for consumers connected 6 or more months at the end of the year. The last year's usage was determined from the average monthly kwh consumption for consumers who were connected during all of 1951 or 6 months during 1952.

New Hampshire 5

Historical consumption records for the consumers interviewed during the survey in New Hampshire 5 indicated a generally rising increase in the use of electricity during the past 10 years. The residential consumers doubled their kwh consumption, and the seasonal consumers increased nearly 45 percent. Many of those interviewed in the survey had been consumers on the New Hampshire 5 lines prior to the inception of the New Hampshire 4 Cooperative. The increases are revealed in the following table:

TABLE III

CONSUMPTION OF ELECTRICITY RELATED TO LENGTH OF TIME
WITH ELECTRIC SERVICE BY CLASS OF CONSUMER AND
DIVISION, NEW HAMPSHIRE 5

<u>Division and Class</u>	<u>Average Kwh Per Month Billed</u>										
	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951
<u>Meredith</u>											
Residential	143	99	109	99	97	98	107	123	136	176	188
Seasonal	--	20	83	87	117	115	123	106	105	115	113
<u>Andover</u>											
Residential	--	47	68	81	76	90	94	91	99	111	146
Seasonal	--	42	61	27	52	41	60	31	35	56	57
<u>Plymouth</u>											
Residential	--	70	68	75	82	70	78	96	113	114	119
Seasonal	--	24	23	27	23	35	40	50	61	53	94
<u>Alton</u>											
Residential	38	96	80	96	105	101	118	177	147	134	135
Seasonal	--	--	--	--	--	--	52	51	64	78	85
<u>North Conway</u>											
Residential	59	70	82	99	83	127	95	102	102	108	139
<u>New Hampshire 5</u>											
Residential	93	74	83	86	89	86	94	111	118	132	147
Seasonal	--	69	71	75	99	99	88	78	83	94	99

SATURATION OF APPLIANCES AND EQUIPMENT

A summary of the saturation of electrical appliances and equipment, measured in terms of the percent of consumers presently having them and a corresponding percent anticipated in the future, was compiled from the field schedules. The difference in saturation, as revealed by the increase in percentage points, was converted to future kwh requirements per 100 consumers for each appliance and piece of equipment. The following tables will show this tabulation for New Hampshire 4 and 5.

TABLE IV

PRESENT AND INDICATED SATURATION OF ELECTRICAL APPLIANCES AND EQUIPMENT AND CORRESPONDING INDICATED INCREASE IN KWH USAGE
NEW HAMPSHIRE 4

Appliance or Equipment	Percent of Consumers		Increase 1/	
	Presently Using	Indicating Future Use	Percentage Points	Kwh Usage Per 100 Consumers
Battery Charger	2	3	1	36
Blanket	5	7	2	750
Broiler	3	3	--	--
Brooder, Chicken (Battery Type)	2	3	1	696
Churn	2	2	--	--
Cleaner, Vacuum	44	53	9	540
Clipper, Animal	4	4	--	--
Clock	46	52	6	288
Compressor	3	4	1	105
Cooler, Milk	12	12	--	1,673
Cream Separator	3	3	--	--
Dishwasher	1	1	--	--
Drill Press	16	22	6	228
Elevator, Rough	2/	2/	--	10
Ensilage Cutter	2/	2/	--	10
Fan, Cent. Hot Air Cir.	1	1	--	--
Fan, Exhaust (Kitchen)	1	1	--	--
Fan, Household	19	21	2	105
Fence	6	7	1	100
Forge	2/	1	2/	12
Freezer (Cabinet)	11	26	15	42,300

2-Table IV - New Hampshire 4 and 5 - September 22, 1952

Appliance or Equipment	Percent of Consumers Presently Using		Percentage Points	Increase ^{1/} Kwh Usage Per 100 Consumers
	Indicating Future Use			
Furnace, Oil	6	6	--	300
Grinder, Tool	11	16	5	375
Heater, Space	11	12	1	210
Heater, Stock Tank	1	1	--	--
Heater, Water (Dairy Pressure Type)	1	2	1	4,000
Heater, Water (Dairy Pour-in Type)	2/	2	1	6,000
Heater, Water (Household)	8	13	5	48,000
Heating Pad	21	23	2	12
Hot Plate	43	48	5	1,050
Iron, Clothes	81	89	8	2,300
Iron, Soldering	11	14	3	105
Iron, Waffle	31	35	4	300
Ironer, Clothes (Mangle)	3	3	--	120
Lamp, Germicidal	1	1	--	--
Lathe	1	4	3	120
Lighting, Barn (Dairy)	10	10	--	35
Barn (Gen.)	23	26	3	192
Garage	16	19	3	96
Grain and Feed Storage Bldg.	1	1	--	--
House	92	100	8	7,500
Milk House	4	5	1	35
Poultry Brooder House	1	1	--	--
Poultry Laying House	5	7	2	245
Shop	9	10	1	48
Yard	23	28	5	414
Other Bldgs.	11	11	--	12
Milking Machine	10	12	2	2,688
Mixer, Food	37	44	7	525
Percolator	22	27	5	780
Pressure System, Lift 22' or Less	30	36	6	3,060
Pressure System, Lift Over 22'	20	27	7	4,560

Appliance or Equipment	Percent of Consumers		Increase ^{1/}	
	Presently Using	Indicating Future Use	Percentage Points	Kwh Usage Per 100 Consumers
Radio	83	92	9	2,600
Range	11	16	4	18,000
Refrigerator	79	89	10	10,440
Roaster	8	10	2	2,400
Sander and Planer	2	2	--	--
Saw, Power	12	16	4	168
Sewing Machine	11	13	2	60
Television Receiver	9	17	8	9,000
Toaster	74	81	7	770
Ventilator, Attic	--	2/	2/	100
Ventilator, Poultry House	--	2/	2/	33
Ventilator, Window	2	2	--	--
Washing Machine	59	66	7	665
Watering Livestock	4	4	--	--
Water Warmer	1	1	--	--
Welder	1	1	--	75

1/ Based on average energy requirements as determined by REA. Data do not reflect instances where more than one of the same appliance exists per consumer. These cases are rare and do not affect the over-all pattern materially.

2/ Less than one-half of one percent.

TABLE V

PRESENT AND INDICATED SATURATION OF ELECTRICAL APPLIANCES AND
EQUIPMENT AND CORRESPONDING INDICATED INCREASE IN KWH USAGE
NEW HAMPSHIRE 5

Appliance or Equipment	Percent of Consumers		Increase ^{1/}	
	Presently Using	Indicating Future Use	Percentage Points	Kwh Usage Per 100 Consumers
Battery Charger	2	2	--	--
Blanket	9	10	1	240
Broiler	4	4	--	--
Brooder, Chicken (Battery)	1	1	--	--
Brooder, Chicken (Hover)	1	1	--	--

2-Table V - New Hampshire 4 and 5 - September 22, 1952

Appliance or Equipment	Percent of Consumers		Increase ^{1/}	
	Presently Using	Indicating Future Use	Percentage Points	Kwh Usage Per 100 Consumers
Cleaner, Vacuum	61	65	4	32
Clock	52	54	2	36
Compressor	1	2	1	14
Cooler, Milk	1	2	1	802
Dishwasher	3	4	1	90
Drier, Clothes	1	2	1	560
Drier, Hair	1	1	--	--
Drill Press	15	17	2	55
Fan, Cent. Hot Air Cir.	1	1	--	--
Fan, Exhaust (Kitchen)	1	2	1	6
Fan, Household	19	19	--	6
Fence	1	1	--	--
Forge	1	1	--	5
Freezer (Cabinet)	11	21	10	16,560
Furnace, Oil	23	26	3	1,650
Grinder, Tool	8	9	1	58
Heater, Space	13	13	--	--
Heater, Water (Household)	13	20	7	34,200
Heating Pad	28	29	1	3
Hot Plate	30	31	1	112
Iron, Clothes	36	87	1	150
Iron, Soldering	9	10	1	57
Iron, Waffle	43	44	1	40
Ironer, Clothes (Mangle)	7	8	1	192
Lathe	3	3	--	5
Lighting, Barn (Dairy)	2	2	--	14
Barn (Gen.)	15	16	1	34
Cave or Spring				
House	1	1	--	--
Garage	28	30	2	23
House	99	100	1	240
Milk House	1	1	--	14
Poultry Brooder				
House	1	1	--	--
Poultry Laying				
House	3	3	--	--
Shop	6	6	--	10
Yard	20	22	2	90
Other Bldgs.	7	8	1	18

3-Table V - New Hampshire 4 and 5 - September 22, 1952

Appliance or Equipment	Percent of Consumers		Increased ^{1/}	
	Presently Using	Indicating Future Use	Percentage Points	Kwh Usage Per 100 Consumers
Milking Machine	1	2	1	530
Mixer, Food	44	50	6	175
Percolator	27	28	1	72
Pressure System, Lift 22' or Less	28	32	4	1,332
Pressure System, Lift Over 22'	12	13	1	283
Radio	87	88	1	120
Range	24	29	5	9,720
Refrigerator	80	83	3	2,412
Roaster	10	11	1	576
Saw, Power	17	19	2	88
Sewing Machine	21	25	4	54
Sprayer, Stationary	1	1	--	--
Stoker, Coal	2	3	1	96
Television Receiver	7	18	11	6,300
Toaster	83	84	1	70
Ventilator, Window	1	2	1	95
Washing Machine	64	67	3	221
Watering, Livestock	1	1	--	--

1/ Based on average energy requirements as determined by REA. Data do not reflect instances where more than one of the same appliance exists per consumer. These cases are rare and do not affect the over-all pattern materially.

ESTIMATED PRESENT AND EXPECTED CONSUMPTION OF ELECTRICITY
AND PERCENT OF CONSUMERS INDICATING USE OF LP GAS

Respondents interviewed throughout the cooperative's area indicated a general increase in the use of electricity within the next 3 years. Farm consumers served by New Hampshire 4 indicated a substantial increase, while the indicated usage by the nonfarm residential consumers varied considerably between divisions. The nonfarm residential consumers in the southern part of the State plan on a greater increase than those in the northern half in the New Hampshire 4 area, but the increase is more evenly distributed throughout the State in New Hampshire 5. The seasonal consumers' anticipated increase is rather constant throughout the State of New Hampshire.

The following tables show the estimated present and expected consumption of electricity and the percent of consumers using and planning to use LP gas by division and class of consumer. The most increase in percent of consumers using or planning to use LP gas was among those living in the southern part of the State and who are served by New Hampshire 4. There was very little increase in the percent using LP gas among the New Hampshire 5 consumers.

TABLE VI

ESTIMATED PRESENT AND EXPECTED CONSUMPTION OF ELECTRICITY AND
LP GAS BY CLASS OF CONSUMER AND DIVISION, 1952, 1953, 1955
NEW HAMPSHIRE 4

Division and Class of Consumer	Percent of Consumers In Division	Average Monthly Kwh			Use of LP Gas	
		Estimated			Present 1952	Percent 1952
		Present Use 1952	Expected Use 1953	1955		
<u>Plymouth</u>						
Farm	30	136	150	223	45	49
Nonfarm residential	34	77	84	91	45	49
Seasonal	36	36	36	40	60	60
<u>Colebrook</u>						
Farm	73	229	235	290	11	11
Seasonal	27	31	37	30	--	--
<u>Lisbon</u>						
Farm	44	232	255	305	25	31
Nonfarm residential	37	128	159	144	25	31
Seasonal	19	20	20	20	25	31
<u>Ossipee</u>						
Farm	33	164	175	192	43	43
Nonfarm residential	29	98	98	110	50	50
Seasonal	38	54	58	65	37	37
<u>Sumapee</u>						
Farm	38	151	174	213	40	45
Nonfarm residential	33	110	127	160	53	65
Seasonal	29	55	57	58	20	20
<u>Pittsfield</u>						
Farm	26	122	124	152	33	33
Nonfarm residential	36	108	120	130	29	35
Seasonal	38	26	32	41	44	56

New Hampshire 4 and 5 - September 22, 1952

Respondents indicated a general increase in the use of kwh in each division served by New Hampshire 4 during the next 3 years. In the Lisbon, Sunapee and Pittsfield Divisions the use of LP gas is expected to increase, while very little increase was indicated in the Plymouth, Colebrook and Ossipee Divisions.

TABLE VII

ESTIMATED PRESENT AND EXPECTED CONSUMPTION OF ELECTRICITY AND
LP GAS BY CLASS OF CONSUMER AND DIVISION, 1952, 1953, 1955
NEW HAMPSHIRE 5

Division and Class of Consumer	Percent of Consumers In Division	Average Monthly Kwh ^{1/}			Use of LP Gas	
		Estimated Present Use 1952	Expected Use 1953	1955	Percent Present 1952	Percent Expected 1955
<u>Central Meredith</u>						
Residential	61	167	173	202	50	52
Seasonal	39	119	120	134	65	65
<u>Plymouth</u>						
Residential	93	119	128	149	45	53
Seasonal	7	107	107	117	50	50
<u>North Conway</u>						
Residential	100	154	159	176	42	46
Seasonal	--	--	--	--	--	--
<u>Alton</u>						
Residential	51	169	181	207	38	42
Seasonal	49	86	87	97	61	61
<u>Andover</u>						
Residential	89	135	157	183	25	31
Seasonal	11	88	88	102	25	31

1/ Average use REA estimates adjusted to actual use in New Hampshire 5.

Respondents in all divisions served by New Hampshire 5 indicated an increase in kwh usage during the next 3 years. Very little increase in number of consumers of LP gas was indicated.

LP GAS COMPETITION

Pick-ups and small trucks can be seen traveling throughout the service areas delivering bottled gas. The prices range from \$8.50 to \$13.50 per 100 pounds, depending upon the distribution plants. A typical distribution plant is shown in Figure 4.

The following table indicates the density of the use of LP gas in the various divisions in New Hampshire 4 and 5.

TABLE VIII

DENSITY OF PRESENT AND FUTURE USERS
OF LP GAS BY DIVISIONS

Division	Percent Not Using	Percent Using	Percent Not Using But Planning To
<u>New Hampshire 4</u>			
Colebrook	90	10	--
Lisbon	75	25	6
Plymouth	38	62	--
Sunapee	68	32	6
Pittsfield	63	37	6
Ossipee	60	40	--
<u>New Hampshire 5</u>			
Central Meredith	44	56	1
Plymouth	51	49	4
North Conway	58	42	4
Andover	75	25	6
Alton	50	50	2

The above table shows the percent of consumers on New Hampshire 4 using LP gas varies from 10 to 62 percent among the divisions. The New Hampshire 5 area has a variance of 25 to 56 percent.

In the area served by New Hampshire 4, 84 percent of the consumers were using LP gas for ranges, 13 percent for water heaters and 3 percent for house heating and refrigeration. In the New Hampshire 5 area, 69 percent were using gas for cooking, 22 percent for water heating and 9 percent for house heating and refrigeration. It will be noted that LP gas is used primarily for ranges and water heaters.

STATUS OF SEASONAL CONSUMERS

For many years people in New England journeyed by train or car to New Hampshire for a summer vacation and stayed in one of the many hotels located in the lake regions and the mountain areas. It is reported the hotels outpriced themselves and motor courts came into existence and became popular. As the shorter work week and longer vacations came into being for salaried people, winter fishing and skiing gradually became more popular. People have become accustomed to making New Hampshire a year-round playground for weekends and summer vacations. Many people, rather than spend so much money for hotel or motel accommodations each year, purchased lots and put up cabins. As time went on, most of the cabins were enlarged and have been made livable for the entire year. During the last 4 or 5 years the average new home built by the seasonal consumers has cost from five to seven thousand dollars. During the war years, these consumers were unable to get sufficient gasoline to make use of their cabins and summer homes. This actually caused a hardship for the cooperative from the loss of this revenue.

Since World War II, most of the new consumers connected have been seasonal, averaging approximately 400 a year. This means the ratio of the number of new seasonal consumers to the number of new nonfarm residential consumers connected annually is also increasing. This condition is expected to continue for at least the next 3 years. The new seasonal consumers are located near the lakes or mountains and in those timbered areas where hunting prevails.

The monthly operating reports and the findings in the survey indicate 35 to 40 percent of the consumers served by New Hampshire 4 are seasonal, using less than 15 percent of the kwh billed during 1951 (exclusive of commercial consumers). Approximately the same percentage of seasonal consumers was found in the survey of New Hampshire 5. Because of the different rate schedules in the area, many of the seasonal consumers in New Hampshire 5 have been carried on the books as residential consumers, and it is not possible to show the percent of kwh billed and the percent of revenue by class of consumer. However, the indicated kwh consumption compared favorably with that indicated by the respondents interviewed in New Hampshire 4 area.

Another point of interest is that the commercial consumers used 12 percent of the annual kwh consumption billed in New Hampshire 4 and produced 3 percent of the total revenue in 1951, while the annual report of New Hampshire 5 indicated the commercial consumers used 48 percent of the total kwh billed and produced 45 percent of the total revenue.

Since the seasonal consumers and a large portion of the commercial consumers (hotels, cabins, camps and roadside eating places) are receiving electric service from New Hampshire 4 and 5, these cooperatives have the peculiar condition of a summertime peak load.

ECONOMIC CHARACTERISTICS

Eighty-two percent of the land in New Hampshire is wooded. An effort is being made to harvest the merchantable timber on a sustained yield basis. Legislation in the State allows special benefits which encourage owners of timbered lands to follow this practice. Most of the cutting has been by portable sawmills. To date these mills have been operated by gasoline or diesel motors. Care of the timbered lands adds much to the recreational value of the State.

The soils of the State as a whole are considered 60 percent forest, 29 percent poor, and 11 percent fair to excellent. It can readily be seen that the income for the State depends on industry and recreation, with agriculture a poor third.

There has been an increase of approximately 8.5 percent in population in the State during the last 10 years as compared to an increase of 14.5 percent for the United States during the same period. The urban population has been decreasing since 1930 and the rural population increasing. The population is predominantly native-born white.

There has been some movement of textile plants from the State to the South. To counteract this, the New England industrial development corporations have been active throughout the State making available venture capital or long-term credit to assist promising firms.

Appreciable quantities of beryllium, mica, copper, asbestos, and kyanite are found in New Hampshire. The Department of Interior has representatives in the State promoting the mining of these minerals. The mining of mica, needed in the defense effort, has gained momentum in the White Mountain area in recent years. A few of the mines are powered by New Hampshire 4 electricity. These are still in the small commercial class. An asbestos plant in Meredith has been in operation over a year and is developing into a monthly average consumption of about 50,000 kwh.

The number of farms has decreased by approximately 29 percent, with the average size of farms increasing from 107 to 128 acres between 1945 and 1950. The average value of land and buildings per farm almost doubled during this same period, from \$40 to \$73 dollars per acre. The average size monthly electric bill per farm in New Hampshire for March 1951 was \$9.22 as compared to \$7.44 for the United States.

Forty-four percent of those residing on the farms they operated received more income from off-farm sources than from the sale of agricultural products; likewise, the same number worked 100 days or more off the farm. Many of these farmers have cabins for rent to tourists.

Of the 46 million dollar agricultural income for the State in 1949, 43 percent was from the sale of poultry and poultry products. Eggs and fryers are the main poultry products. Dairy products sold, consisting mostly of market milk produced for the Boston milk shed, accounted for 33 percent of the State farm income. Milk is shipped from as far north as Colebrook, New Hampshire, near the Canadian border. Should more milk become available nearer Boston and the milk inspection laws become more rigid, it is questionable whether the Colebrook area would remain in the Boston milk shed. However, Colebrook, being a natural dairy area with its hay and pasture lands, will continue to produce dairy products in some form. The gross income from the sale of farm products averaged nearly \$3,500 per farm for the State during 1949. There were 51 farms reporting irrigation in 1949 for a total of 622 acres as compared to 10 farms and 63 acres in 1944. Almost 90 percent is sprinkler irrigated. Since there is an increased interest in sprinkler irrigation in the Pittsfield substation area, it can logically be assumed the farmers will in time turn to the use of electricity for operating their sprinkler systems as is being done in many of the Western States. There are two local Production Credit Association Offices serving the area, one located in the State and one in Vermont which services the northwestern part of New Hampshire. Total loans made in 1951 were 1,320 for over 3 million dollars; outstanding as of December 31, 1951, was over 1½ million. The Farmers Home Administration has 4 offices located in the State. Total loans for 1951 were about \$380,000 with a little over \$1,000,000 outstanding as of December 31, 1951.

A survey of current business by the Commerce Department indicated the income for New Hampshire and the United States for 1950 was distributed as follows:

Source of Income	Percent	
	N. H.	U. S.
Manufacturing	31.2	22.6
Trades and Service	25.2	26.3
Government	15.5	16.2
Agriculture	3.4	7.5
Miscellaneous	24.7	28.4

Marketing facilities appear adequate. Poultry and dairy products are sold locally as needed and the remainder disposed of on the Boston market. The maximum haul of milk is over 200 miles from Colebrook to Boston.

Railroads and highways traverse the area. Most of the main roads are oiled and kept in reasonably good repair the year around. Snow removal equipment is adequate to keep the roads open for winter travel.

PHYSICAL CHARACTERISTICS

The topography of this area is rolling, with mountains in the northern section. The growing season averages from 99 days in Grafton to 153 days at Concord. Varying temperatures and snowfall exist throughout the State. In the mountainous areas of forests and lakes the snowfall is from 2 to 8 feet. Lakes normally are frozen over throughout the winter. The Connecticut River Bottom consists of terminal moraine and glacial wash forming the better farming area for the northern and western sections of the State. One heavy sleet storm can be anticipated every 6 years. There are no severe droughts recorded for the State; however, they are found in small areas in varying degrees on occasion but never have covered the whole State at one time.

ANALYSIS OF FUTURE KWH CONSUMPTION

Since New Hampshire 4 was energized in March 1940, the average monthly consumption rose from 47 to 95 kwh in 1951. This is an increase of approximately 4 kwh per month in the average monthly consumption. Farm consumers during this same period increased from 51 to 172 kwh, or 11 kwh monthly. Nonfarm residential consumers increased from 26 kwh in 1941 to 95 kwh in 1951, or approximately 6 kwh monthly. In New Hampshire 5 there are no operating records available; however, kwh consumption for those interviewed in the survey indicated 93 kwh per consumer for residential consumers in 1941 and 147 kwh in 1951. This is an increase of approximately 5 kwh monthly. The seasonal consumers increased from 69 to 99 kwh from 1942 to 1951, or an increase of approximately 3 kwh monthly.

As revealed by the data obtained from the respondents interviewed, the consumers in this area are not using electrical energy at the average rate for the entire country as determined by REA. The actual average consumption taken from the billing records is 70 percent of the indicated present consumption for farm consumers, 73 percent for nonfarm residential consumers, but 112 percent for the seasonal consumers (based on a 3-month period) for New Hampshire 4. For New Hampshire 5, those consumers interviewed were actually using 84 percent for the residential consumers and 96 percent for the seasonal consumers (based on a 7-month period). Using the above percentages for each class of consumer, the indications of present and future kwh consumption within the next 3 years appear to have the same monthly kwh increase as has been shown during the past 10 years. On this basis, it appears reasonable to believe the New Hampshire 4 farm consumers would average 202 kwh monthly, nonfarm residential consumers 121 monthly, and seasonal consumers 46 kwh monthly. In the case of New Hampshire 5 the residential consumers would use 180 kwh per month, and the seasonal consumers 112 kwh per month. These averages should be attained within 3 years from the date of the field appraisal. To reach the increase indicated above, specific additional kwh resulting from additions of appliances and equipment, as shown in the following tables, must be achieved.

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TABLE IX

COMPONENT EFFECT OF APPLIANCES AND EQUIPMENT
ON INDICATED ADDITIONAL USE OF ELECTRICITY
NEW HAMPSHIRE 4

Appliance or Equipment	Additional Kwh Use Per 100 Consumers	Percent of Total Additional Use	Estimated Additional Kwh Use
<u>Major Household Usage</u>	<u>150,100</u>	<u>86.2</u>	<u>120,500</u>
Water Heater (House)	48,000	27.5	36,000
Freezer (Cabinet)	42,300	24.3	32,000
Range	18,000	10.3	13,500
Refrigerator	10,440	6.0	10,000
Television Receiver	9,000	5.2	7,000
House Lighting	7,500	4.3	7,500
Pressure System - Lift Over 22'	4,500	2.6	4,500
Pressure System - Lift 22' or Less	3,060	1.8	3,000
Radio	2,600	1.5	2,500
Roaster	2,400	1.4	2,000
Iron	2,300	1.3	2,500
<u>Major Production Usage</u>	<u>14,361</u>	<u>8.2</u>	<u>14,000</u>
Dairy Water Heater (pour-in type)	6,000	3.4	6,000
Dairy Water Heater (pressure type)	4,000	2.3	4,000
Milking Machine	2,688	1.5	2,500
Milk Cooler	1,673	1.0	1,500
<u>Miscellaneous</u>	<u>9,785</u>	<u>5.6</u>	<u>7,500</u>
Balance of Indicated Usage	9,785	5.6	7,500
Totals	174,246	100.0	142,000

TABLE X

COMPONENT EFFECT OF APPLIANCES AND EQUIPMENT
ON INDICATED ADDITIONAL USE OF ELECTRICITY
NEW HAMPSHIRE 5

Appliance or Equipment	Additional Kwh Use Per 100 Consumers	Percent of Total Additional Use	Estimated Additional Kwh Use
<u>Major Household Usage</u>	<u>72,174</u>	<u>93.3</u>	<u>65,100</u>
Water Heater (Household)	34,200	44.2	30,000
Freezer (Cabinet)	16,560	21.4	15,000
Range	9,720	12.6	9,000
Television Receiver	6,300	8.2	6,000
Refrigerator	2,412	3.1	2,200
Oil Furnace	1,650	2.1	1,600
Pressure System - Lift 22' or Less	1,332	1.7	1,300
<u>Miscellaneous</u>	<u>5,141</u>	<u>6.7</u>	<u>4,600</u>
	<u>5,141</u>	<u>6.7</u>	<u>4,600</u>
<u>Totals</u>	<u>77,315</u>	<u>100.0</u>	<u>69,700</u>

MAJOR USES OF ELECTRICITY

It is apparent from Table XI that seasonal consumers in New Hampshire 4 will use about 10 percent of the total estimated kwh usage of the cooperative while New Hampshire 5 seasonals will use about 40 percent of its estimated kwh load, excluding commercial. Major uses will be for heating water, refrigeration, cooking, and house lighting. Among the nonseasonal consumers, household uses represent two-thirds of the total for New Hampshire 4 and four-fifths of the total estimated kwh load in New Hampshire 5. For the nonseasonal users, heating water, refrigeration, cooking, and houselighting also predominate. Major farm productive uses in New Hampshire 4 represent about 15 percent of the estimated total kwh consumption with no farm productive uses in New Hampshire 5. Under "Estimated Kwh Uses per 100 Consumers" for New Hampshire 4 and New Hampshire 5, consideration was given to the number of months the seasonals were using electricity and in other classes the ratio of actual kwh use to the average estimates as determined by REA was considered.

TABLE XI

INDICATED AND ESTIMATED COMPONENT EFFECTS OF APPLIANCES AND EQUIPMENT USAGE ON OVER-ALL FUTURE USE OF ELECTRICITY
NEW HAMPSHIRE 4 AND 5

Class of Consumer	Appliance or Equipment	New Hampshire 4			New Hampshire 5			
		Indicated Kwh Usage Per 100 Consumers	Percent of Total Kwh Usage Indicated Per 100 Consumers	Estimated Kwh Usage Per 100 Consumers	Indicated Kwh Usage Per 100 Consumers	Estimated Kwh Usage Per 100 Consumers	Estimated Kwh Usage Per 100 Consumers	
<u>Seasonal</u>								
<u>Major Uses</u>								
Water Heater (Household)	39,000	19.7	10,000	70,500	29.4	41,000		
Refrigerators	34,200	17.3	8,500	27,000	11.3	16,000		
House Lighting	32,700	16.5	8,000	31,320	13.1	18,000		
Range	21,600	10.9	5,500	37,080	15.5	22,000		
Pressure Systems	14,820	7.5	4,000	11,994	5.0	7,000		
Radio	9,800	4.9	2,500	7,790	3.2	4,500		
Iron	8,100	4.1	2,000	7,210	3.0	4,200		
Freezer (Cabinet)	7,200	3.6	1,800	13,230	5.5	7,700		
TV Receiver	3,960	2.0	1,000	4,752	2.0	2,800		
Miscellaneous Uses	26,803	13.5	6,700	28,914	12.1	17,000		
Total Seasonal Consumers	198,183	100.0	50,000	239,790	100.0	140,200		
<u>All Other Consumers</u>								
<u>Major Household Uses</u>								
Water Heater	79,000	14.5	70,000	58,200	23.0	34,500		
Refrigerator	65,880	12.1	60,000	31,968	12.6	29,000		
Freezer (Cabinet)	63,900	11.8	57,000	20,430	8.1	20,000		
Household Lighting	60,600	11.2	54,000	30,240	12.0	23,000		
Range	34,800	6.4	31,000	34,680	13.7	31,000		
Pressure Systems	23,640	4.4	23,000	7,968	3.2	7,900		
Radio	20,700	3.8	18,000	10,700	4.2	10,000		
Iron	19,600	3.6	19,000	9,340	3.7	9,000		
TV Receiver	14,400	2.7	14,000	6,696	2.6	6,500		

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Class of or Consumer Equipment	Appliance	New Hampshire 4			New Hampshire 5		
		Indicated Percent Kwh Usage of Total Per 100 Consumers	Estimated Kwh Usage Indicated Per 100 Consumers	Kwh Usage Consumers	Indicated Percent Kwh Usage of Total Per 100 Consumers	Estimated Kwh Usage Indicated Per 100 Consumers	Kwh Usage Consumers
<u>Productive Uses</u>							
Milk Cooler	61,901	11.4	44,000	---	---	---	---
Milking Machine	14,208	2.6	14,000	---	---	---	---
Dairy Water Heater (Press. Type)	10,000	1.8	7,000	---	---	---	---
Dairy Water Heater (Pour-in Type)	7,500	1.4	5,500	---	---	---	---
<u>Miscellaneous Uses</u>							
	66,904	12.3	47,000	42,566	16.8	38,000	
Total All Other Consumers	543,033	100.0	463,500	252,788	100.0	213,900	
Total All Consumers	741,216		513,500	492,578		354,100	

TRENDS RELATED TO THE RATE OF INCREASE
IN THE USE OF ELECTRIC POWER

The following table shows various trends related to the rate of increase in the use of electric power from 1930 to 1951 for New Hampshire and the United States and the ratio of New Hampshire to the Nation.

TABLE XII

TRENDS RELATED TO THE RATE OF
INCREASE IN USE OF ELECTRIC POWER

Item and Relationship	Trend				
<u>Farm Operator Family</u>					
<u>Level of Living Index</u>	<u>1930</u>	<u>1940</u>	<u>1945</u>	<u>1950</u>	
New Hampshire	105	115	137	151	
United States	75	79	100	122	
Ratio State to Nation	1.4	1.5	1.4	1.2	
<u>Average Cost Energy Purchased</u>	<u>1946</u>	<u>1947</u>	<u>1948</u>	<u>1949</u>	<u>1950</u>
New Hampshire 4	1.26¢	1.30¢	1.39¢	1.41¢	1.29¢
United States	.99	.97	.96	.96	.89
Ratio N.H. 4 to Nation	1.27	1.34	1.45	1.47	1.42
<u>Percent Dairy Farms</u>	<u>1935</u>	<u>1940</u>	<u>1945</u>	<u>1950</u>	
New Hampshire	29.1	22.9	17.0	22.1	
United States	9.6	10.2	9.5	11.2	
Ratio State to Nation	3.03	2.25	1.79	1.97	
<u>Population</u>	<u>1930</u>	<u>1940</u>	<u>1950</u>		
	(000) %Change	(000) %Change	(000) %Change		
New Hampshire	465 ↑ 5.1	491 ↑ 5.6	533 ↑ 8.5		
United States	122,755 ↑ 16.1	13,669 ↑ 7.2	150,697 ↑ 14.2		
Ratio State to Nation	.31	.78	.60		

There are two factors which may tend to have an adverse effect upon future consumption regardless of the rising level of economic conditions. One is the cost of power which is shown in the above table. While the average cost of energy purchased decreased between 1949 and 1951, it is considerably higher than the average for the Nation. The second effect is the use of LP gas. As has been previously indicated, the primary uses are for cooking and water heating. Lower average power cost, particularly as reflected in consumer rates, and the provision of an economic advantage of electricity over LP gas as a source of energy, are fundamental to any substantial increases in average consumption for members of this system.

WHY MORE ELECTRICITY IS NOT USED BY CONSUMERS

The field appraisers asked the following question of each consumer interviewed: "Why do you not use more electricity?" The usual answer was that they were using all the electricity they needed. In those instances where the respondent felt more electricity was needed or could be used, the following table shows the percentage of consumers indicating their reason for not using more electricity:

<u>Reason or Answer</u>	<u>N. H. 4 Percent</u>	<u>N. H. 5 Percent</u>
Cannot afford to use more	55	59
Rates are too high	24	22
Low voltages and outages	21	18
Opposed to REA in N. H.	--	1

Fifteen percent of the respondents interviewed in New Hampshire 4 answered the above question; 25 percent in New Hampshire 5.

OBSERVATIONS AS TO POSSIBLE MEANS
FOR INCREASING USE OF ELECTRICITY

At the time the appraisers were making their survey, the employment of a full-time power use man was being considered by the cooperative. Some of the things which could be accomplished are:

1. The propaganda dispersed by LP gas distributors relative to power outages and lower cost for cooking could be combated by:
 - a. Circulating leaflets among the members showing the advantages of electricity over LP gas as well as the cost of cooking with electricity versus the cost of using LP gas, and
 - b. Instituting an educational program for cooperative personnel as to the advantages of electricity over LP gas in order to counteract local LP gas propaganda. Many employees of the cooperative live and work in the various divisions of the area.
2. Acquaint all cooperative personnel coming in contact with farm consumers of the value of using electric power to operate sprinkler irrigation systems.
3. Circulate data showing the use and advantages of electrical equipment on farms--such as barn cleaners in dairies.
4. Impart the knowledge to all consumers the fact that when a higher bracket is reached in the use of kwh there is a decrease in the cost per kwh.

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The time used for this or a similar type of program would increase kwh usage, keep consumers advised concerning kwh rate schedules, and would offset the lack of aggressiveness of electrical appliance dealers in the area.

In view of the data available and the foregoing analysis, it is certified that the following average monthly estimates are reasonable and may be expected to be attained by the years specified:

<u>Class of Consumer</u>	<u>Calendar Year 1951</u>	<u>1954</u>	<u>1957</u>	<u>1962</u>
<u>New Hampshire 4</u>				
Farm	172 ^{1/}	205	235	290
Nonfarm residential	95 ^{1/}	110	135	175
Seasonal	31 ^{1/}	45	50	60
<u>New Hampshire 5</u>				
Residential	147 ^{2/}	170	200	255
Seasonal	99 ^{2/}	105	120	140

1/ Source: Monthly Operating Reports.

2/ Source: The billing records of the respondents interviewed.

